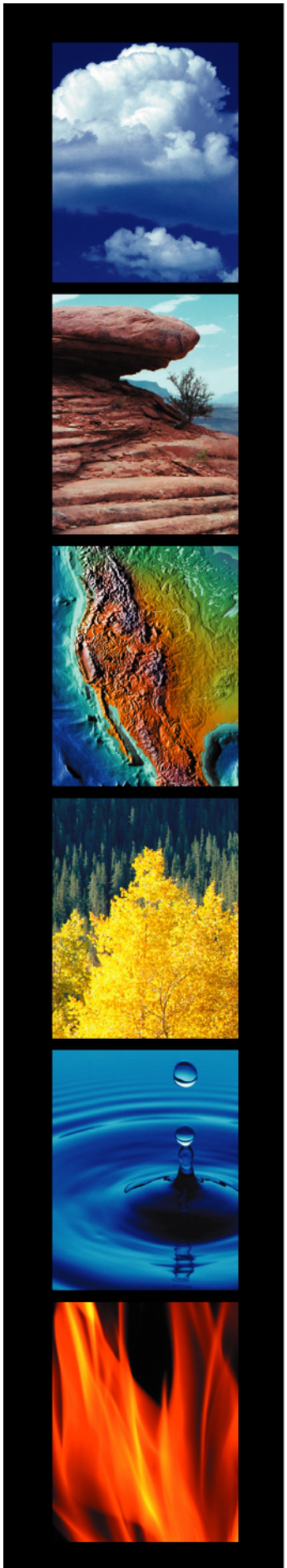

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Frontiers in Geoscience Colloquium

Monday, June 27, 2016
3:00pm – 4:00pm
Physics Auditorium (TA-3, Bldg 215)

Plant Nanobiotechnology: Augmenting Plant Function with Nanomaterials

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Plant nanobiotechnology is an emerging field that aims to interface plants with nanomaterials for augmenting and studying plant function. This approach demonstrated that spontaneous penetration of carbon nanotubes (CNT) within chloroplasts results in enhanced light energy conversion into electron flow. Cerium oxide nanoparticles (nanoceria) were also shown to act as potent scavengers of damaging reactive oxygen species (ROS) at the sites of generation in chloroplasts. The mechanisms of enhancement of the light reactions of photosynthesis by nanoparticles are not well understood, but the evidence is consistent with CNT expansion of the chloroplast solar energy harnessing spectrum. Recently, we augmented leaf scavenging of ROS with nanoceria creating nanobionic plants with enhanced carbon reactions of photosynthesis under light stress. CNT also enabled near-infrared fluorescence monitoring of chemicals in plants, demonstrating the potential of nanoparticles as plant biomolecule sensors and augmenting plants to function as chemical sensors. Ratiometric CNT sensors were independently functionalized to recognize either a chemical or no analyte (remaining invariant), thus creating an optical sensor that detects the analyte presence in biological tissues, invariant to the absolute intensity emitted from the sensors. Interfacing plants with CNT ratiometric sensors transforms plants into detectors of contaminants in the environment with infrared communication platforms that send information to electronic devices. Our results highlight that plant nanobiotechnology can create nanobionic plants with novel and augmented functions and provide novel tools for plant biology research.

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